# REMOVAL OF CRYSTAL VIOLET DYE FROM A SYNTHETIC SOLUTION USING BORASSUS FLABELLIFER

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***Abstract***

*Use of various dyes in order to color the products is a common practice in textile industry. The presence of these dyes in a water even at low concentration is highly visible and undesirable. Adsorption experiments were carried out for the removal of dye using Palm Tree Male Flower Activated Carbon (PTMFAC) as the adsorbent by various parameters. Dye removal from industrial wastewater is an important environmental concern. The most widely used adsorbent is commercially available activated carbon. Despite of the frequent use of adsorption in wastewater treatment systems, commercially available activated carbon remains an expensive. In recent years, the safe and economical methods are required for the treatment of textile effluents, which is involved researchers into focus towards the preparation of low cost adsorbents from cheapest sources. This study was carried out for the utilization of Borassus Flabellifer (PTMFAC) as adsorbent for the removal of dyes from waste water and to establish it as a standard wastewater treatment process for textile dyeing industry. This batch adsorption experiment was carried out for finding the effects of adsorbent's dosage, concentration, pH and contact time on the removal of dyes from the waste water*

***Keywords:*** *borassus flabellifer, crystal violet, dye, absorbent*

## Introduction

One of the main sources of severe pollution problems worldwide is the textile is dye containing waste water .There are three basic needs that a man possesses are food, and shelter. The global textile and clothing industry is pound to be a huge ,as it fulfills the second basic requirement of the man .This is because of people are getting increase in the conscious of the way they dressed. It has become a means to create an impression and represent their personality .Everybody wants to strike an impression with different and fashionable cloth.

## General

The main aim of the present work is to make the adsorption of dye namely crystal violet, using the adsorbent activated carbon PTMF prepared from Borassus Flabellifer.

## Objective

- To prepare variety of activated carbon from Borassus Flabellifer using different physical and chemical activation methods.
- Among the activated carbon, one superior carbon was selected for the adsorption studies.

- The selected activated carbon is used for the removal of crystal violet, from its aqueous solution in batch mode adsorption.
- Application of these adsorbents for the treatment of the various dyeing industrial effluents was also demonstrated to identify the cheap and efficient low cost method for industries.

**Scope of the Experiment**

- Low cost adsorbents can be used for water treatment.
- This is used to develop more efficient selective, inexpensive and eco-friendly low cost absorbent for Water treatment.
- Continuous process can be used for adsorption process

**Methods and Materials**

**Collection of sources**

Borassus Flabellifer is a robust tree and can reach a height of 30 meters (9.8 feet) long, with robust black teeth on the petiole margins. Like all Borassus species, Borassus Flabellifer is dioeciously with male and female flowers on separate plants. The male flowers are less than 1 cm long and form semicircular clusters, which are hidden beneath scale like bract swith in the catkin like in flore scences. In contrast, the female flowers are golf ball sized and solitary, sitting upon the surface of the in florescence axis

**Experimentalsetup**

**Preparation of Activated Carbon Procedure**

35ml of sulphuric acid and distilled water is taken in the one litre water bottle and 50g of biomass is added.The whole setup is kept for 12 hours. Whattsman filter paper is used for filtering the ash .

The ash will be placed in the oven at 110 for 12 hours

**Figure 1 Activated carbon**

**Batch Study**

Batch experiments were carried out to examine the adsorption properties of PMTFAC. The adsorbents prepared for 50gm biomass is, 20ml 0f distilled water and 35ml of concentrated sulphuric

acid added to it. This mixture should be kept remain for 24 hours. Subsequently, the suspensions were separated by filtering. Prior to their use, the adsorbents were oven-dried at 110°C for 12 hours to eliminate traces of moisture. After that placed in muffle furnace for 3hours at 450°C,then the ash is converted into an activated carbon. The effect of solution pH on dye removal was investigated similarly as described above by changing the initial pH (2 - 12) adjusting by dilute HCl or NaOH. The dye solution is prepared by adding 1gm of dye into the distilled water. A predetermined amount of PMTFACwasaddedtodyesolutionofvaryingconcentration.Themixturewasstirredwith orbital shaker (150 rpm) at room temperature for a predetermined time. All adsorption data are reported in this paper for five differentdyes

**Effect of Contact Time on the Adsorption**

From an economical point of view, the contact time required to reach equilibrium an important parameter in waste water treatment. In order to investigate effect of contact time, the experiments were carried out for15, 30, 45…360 min, using the fixed adsorbent dosage at constant pH and dye concentration of 100ppm

**Table 1 Effect of contact time**

| Time(Minutes) | Efficiency (%) |
|---|---|
| 15 | 07.63 |
| 30 | 15.97 |
| 45 | 29.86 |
| 60 | 29.16 |
| 75 | 36.11 |
| 90 | 65.27 |

**Effect of Concentration**

The optimum pH was found at pH 7 for borassus falbellifer then pH is constant and concentration should be varies at a range of 50-1000ppm and 0.3 g of adsorbent was added. The sample was into the shaker at for a time period of 1hours.Then the samples were analyzed for spectro photometer.

**Table 2 Effect of concentration**

| S. No | Intial Concentration | Final Concentration | % of Removal |
|---|---|---|---|
| 1 | 50 | 2.286 | 47.98 |
| 2 | 100 | 4.429 | 34.75 |
| 3 | 250 | 35.857 | 30.53 |
| 4 | 500 | 53.714 | 15.27 |
| 5 | 750 | 84.429 | 18.39 |
| 6 | 1000 | 193.800 | 80.620 |

**Effect of Dosage**

The optimum pH7 for borassus falbellifer and the optimum concentration100 ppm should be constant. The dosage should be varied from (0.2-0.6) and added. The solutions are kept in anorpital shaker at 3000 rpm for a time period of 1hours.

**Table 3 Effect of dosage**

| S.NO | Weight (G) | Initial Concentration | Final Concentration | % OF Removal |
|---|---|---|---|---|
| 1 | 0.2 | 100 | 4.133 | 77.16 |
| 2 | 0.3 | 100 | 9.800 | 77.56 |
| 3 | 0.4 | 100 | 13.133 | 78.47 |
| 4 | 0.5 | 100 | 13.800 | 36.38 |
| 5 | 0.6 | 100 | 9.133 | 72.55 |

**Effect of PH**

The 100ml samples of Crystal Violet dye solution (100ppm) were prepared and their pH was varied from 2 to 8 using and 0.3 g of borassus falbellifer was added. The samples were then kept in a shaking incubator for a time period of 1 hour after which samples were collected and analyzed using spectrophotometer.

**Table 4 Effect of PH**

| S.No | PH | Initial Concentration | Final Concentration | % OF Removal |
|---|---|---|---|---|
| 1 | 2 | 100 | 60.13 | 39.58 |
| 2 | 4 | 100 | 67.55 | 30.55 |
| 3 | 6 | 100 | 55.23 | 65.27 |
| 4 | 7 | 100 | 80.16 | 15.27 |
| 5 | 8 | 100 | 50.05 | 48.61 |
| 6 | 10 | 100 | 12.42 | 84.72 |
| 7 | 14 | 100 | 5.857 | 94.14 |

**Conclusion**

Maximum percentage of colour removal for textile dyeing industry effluent and optimum values of variables is given in the following table

**Table 5 Optimum values of variables**

| Variable | Optimum Value | Maximum % of Color Removal |
|---|---|---|
| TIME | 90 | 98.11 |
| PH | 8 | 76.47 |
| DOSAGE | 1.5 | 74.50 |
| CONCENTRATION | 20 | 94.11 |

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